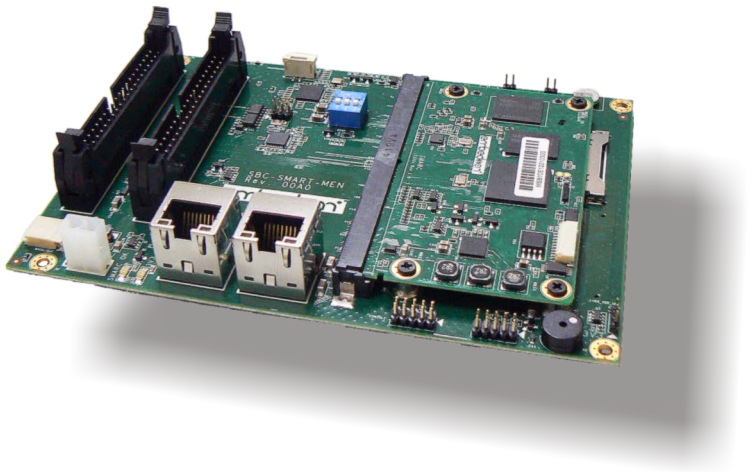
User's Manual

SMART Series Single Board Computer



SBC-SMART-MEN

Revision History

Revision	Date	Changes from Previous Revision
1.0	2014/04/08	Initial Release

USER INFORMATION

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Using this Manual

This guide provides information about the Embedian *SBC-SMART-MEN* Single Board Computer based on TI Sitara AM335x Cortex-A8 processor and SMARC T335X module.

Conventions used in this guide

This table describes the typographic conventions used in this guide:

This Convention	Is used for
Italic type	Emphasis, new terms, variables, and document titles.
`monospaced type`	Filenames, pathnames, and code examples.

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Document Updates

Please always check the product specific section on the Embedian support website at www.embedian.com/ for the most current revision of this document.

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Additional Resources

Please also refer to the most recent *SBC-SMART-MEN* User's Manual and TI AM335x processor reference manual and related documentation for additional information.

Introduction

This Chapter gives background information on the *SBC-SMART-MEN* single board computer.
Section include：

- Feature Set Overview
- Block Diagram
- Peripheral Overview
- Layout Diagram
- Mounting Holes Mechanical Drawing
- Document and Standard References

Chapter 1 Introduction

This document serves as a user manual and technical reference for the EMBEDIAN *SBC-SMART-MEN* single board computer. The manual is intended for use by engineering personnel working with *SBC-SMART-MEN* systems.

By adding a USB hub and Silicon Lab CP2108 and CP2102, *SBC-SMART-MEN* expand many RS232s and USB Host ports for users to interface with their legacy devices.

SBC-SMART-MEN single board computer is a hybrid approach combines a SMARC COM for the CPU engine with a baseboard for the I/O and application interface. The advantages of this architecture are that system can be easily upgraded by simply changing the SMARC module or expanded by replacing the carrier board. The SMARC module is an industrial standard.

1.1 Feature Set Overview

The *SBC-SMART-MEN* has the following features:

- Length x Width: 102mm x 145mm (4.0" x 5.7"), 3.5-inch form factor
- 24-bit color packing, single channel LVDS port.
- 18-bit color packing, single channel LVDS port
- 3.3V or 5V LCD signaling option
- Reset Jumper
- 5V LED Backlight support
- 1 x Buzzer
- 6 x RS232 ports
- 1 x RS422/RS485 (Share with RS232 Port 1)
- 3 x USB Host 2.0
- 1 x USB OTG
- 1 x Serial-to-USB
- 2 x Fast Ethernet (10/100Mbps) ports with integrated magnetics.
- Audio: Microphone Input and Headset Output
- 1 x CAN Bus (with transceiver)
- 2 x I2C Bus
- 11 x GPIOs
- 2 x SPI Bus
- Boot Option Switch
- SD Card slot.

- 4-wire Touch Connector
- RTC backup power sources – Lithium coin cell onboard.
- 5V input voltage
- External WDT option
- Two 4KB EEPROM is provided on I2C0 that holds the board information of SMARC module and Carrier Board. This information includes board name, part number, serial number, and revision information.

1.2 Block Diagram

An overall system block diagram for the *SBC-SMART-MEN* single board computer is shown on the following page. The following color coding is used on the block diagram:

- Industry standard wired I/O connectors are shown in orange.
- Embedian defined wired I/O connectors and headers are shown in red.
- Industry standard mezzanine and slot format connectors are shown in blue.
- ICs on the board are shown in pale yellow.
- Miscellaneous features (jumpers, switches) are shown in drab green.

Much may be gleaned from this diagram:

- What the major features are.
- An indication of the power supply architecture.

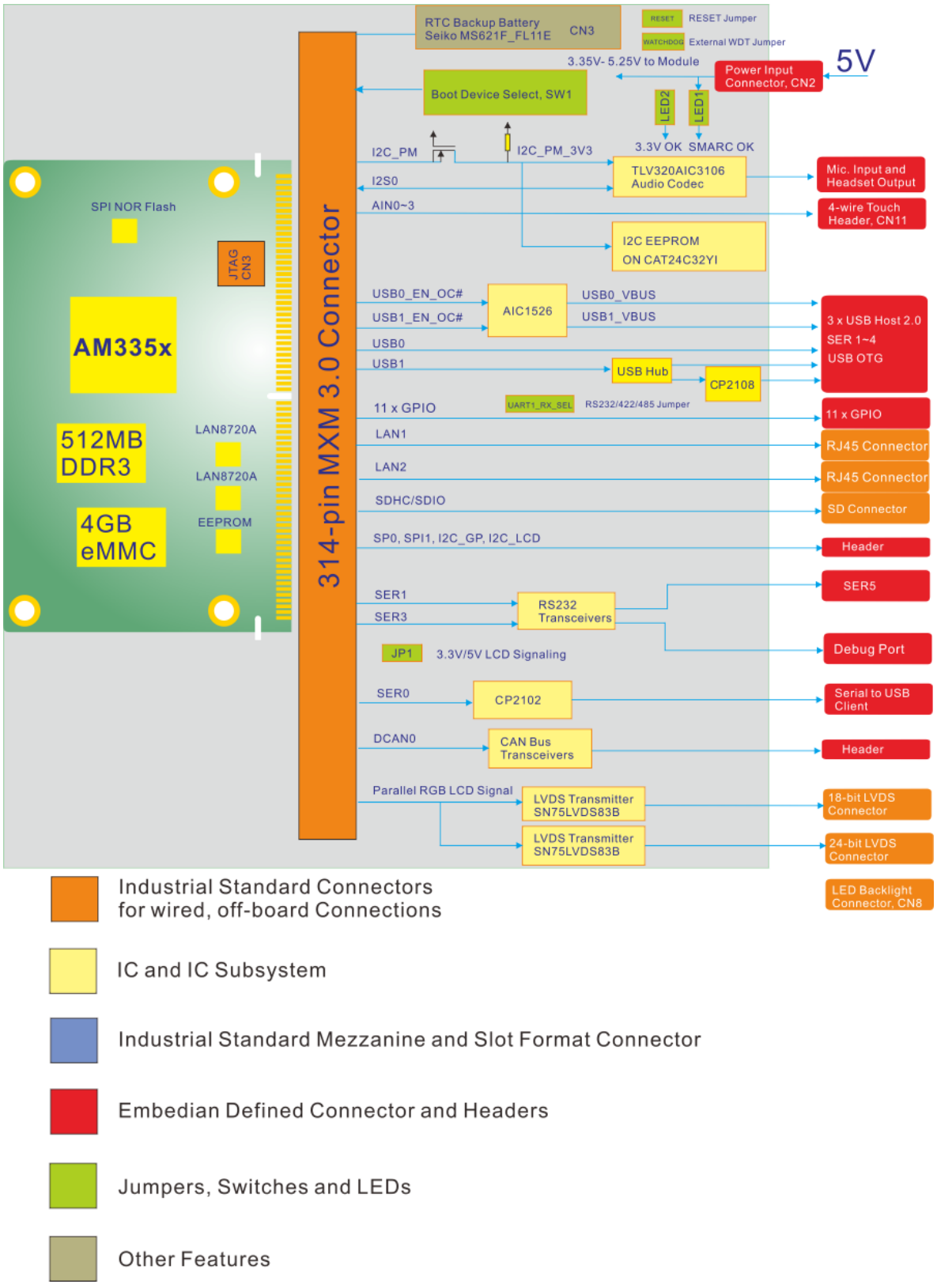


Figure 1: SBC-SMART-MEN Block Diagram

Details for this diagram will be explained in the following chapters.

1.3 Peripheral Overview

The following diagram shows the function of all peripherals including of connectors, headers, configuration jumpers and other important features on the *SBC-SMART-MEN* single board computer.

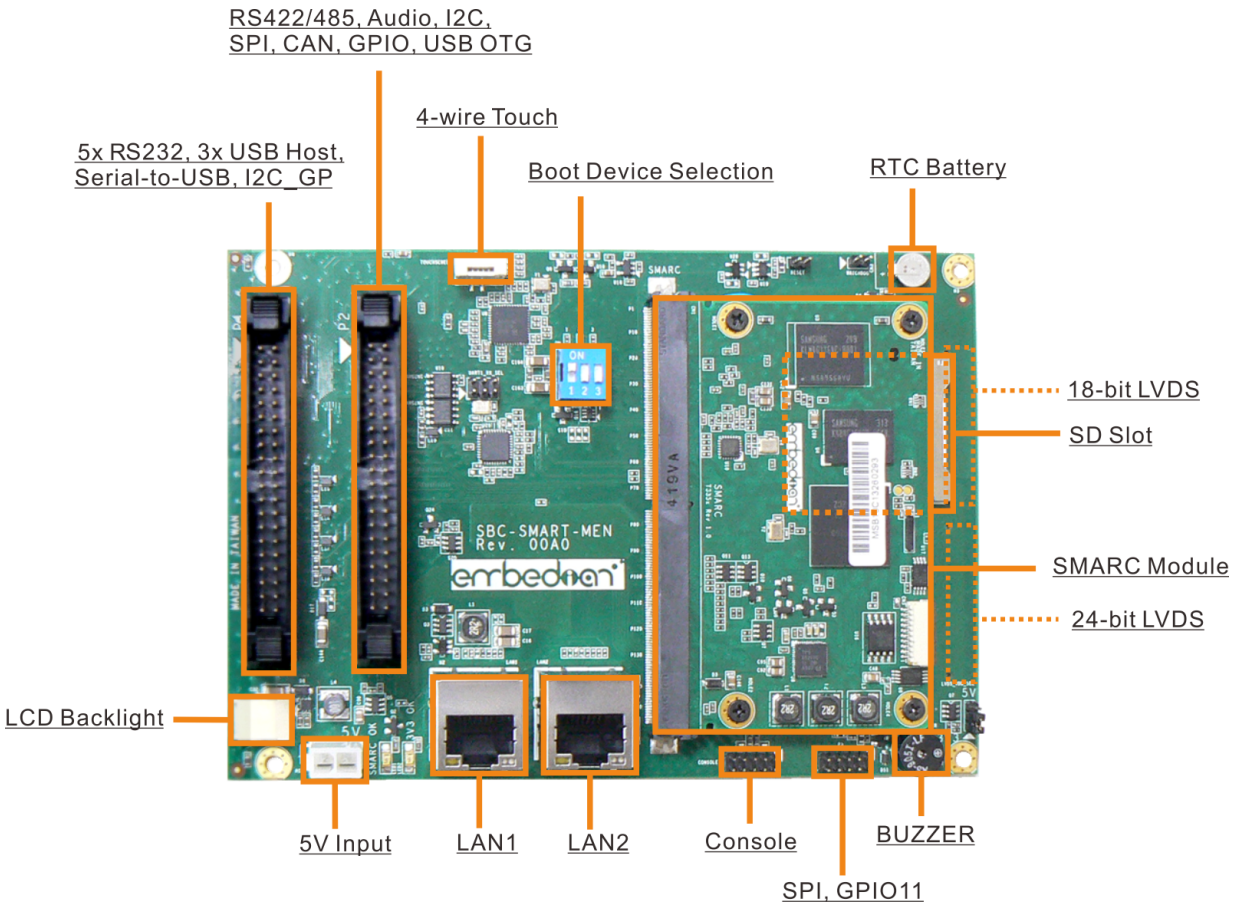


Figure 2: SBC-SMART-MEN Peripheral Diagram

1.4 Layout Diagram

The following section shows the physical location and reference designator of connectors, configuration jumpers and other important features on the *SBC-SMART-MEN* single board computer.

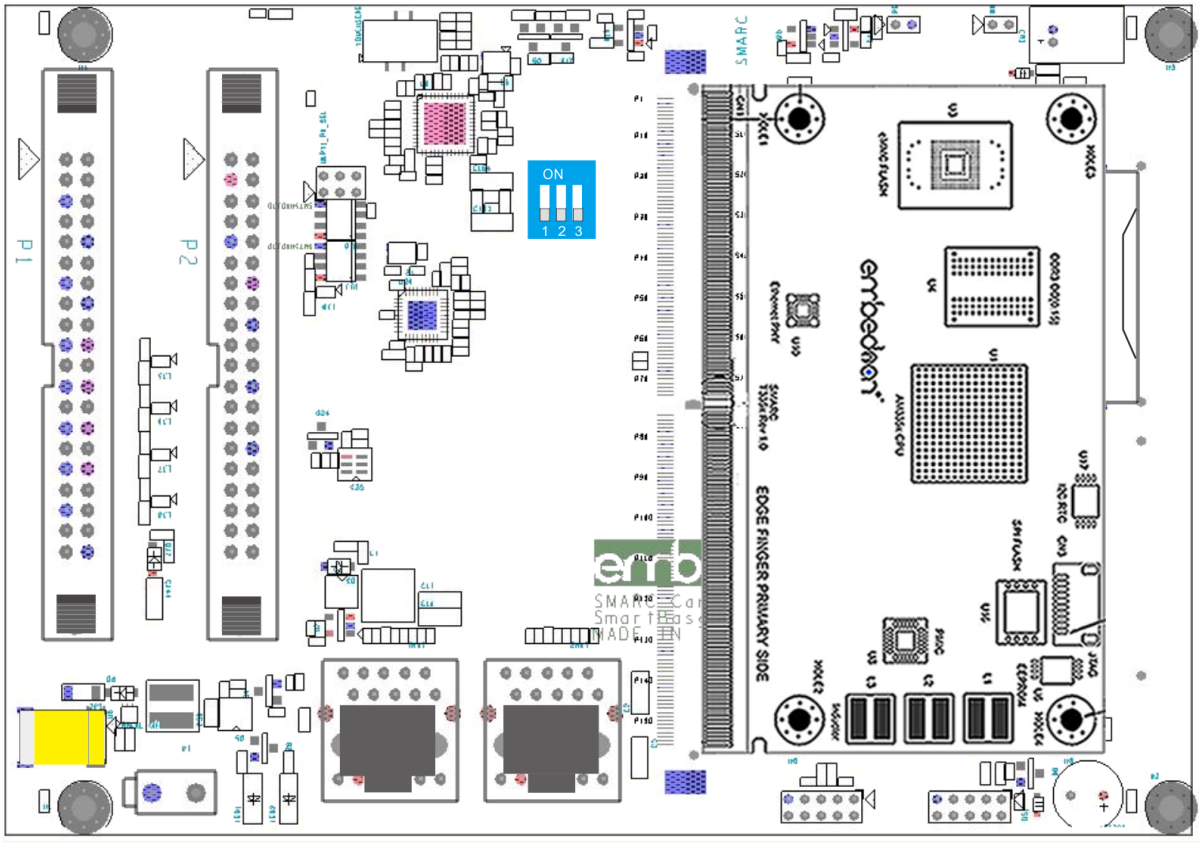


Figure 3: SBC-SMART-MEN Connectors, Headers and Jumpers

1.5 Mounting Holes Mechanical Drawing

Figure 4 shows the mounting holes information of *SBC-SMART-MEN*. The diameter of mounting hole is 3.2mm and diameter of ring is 6mm.

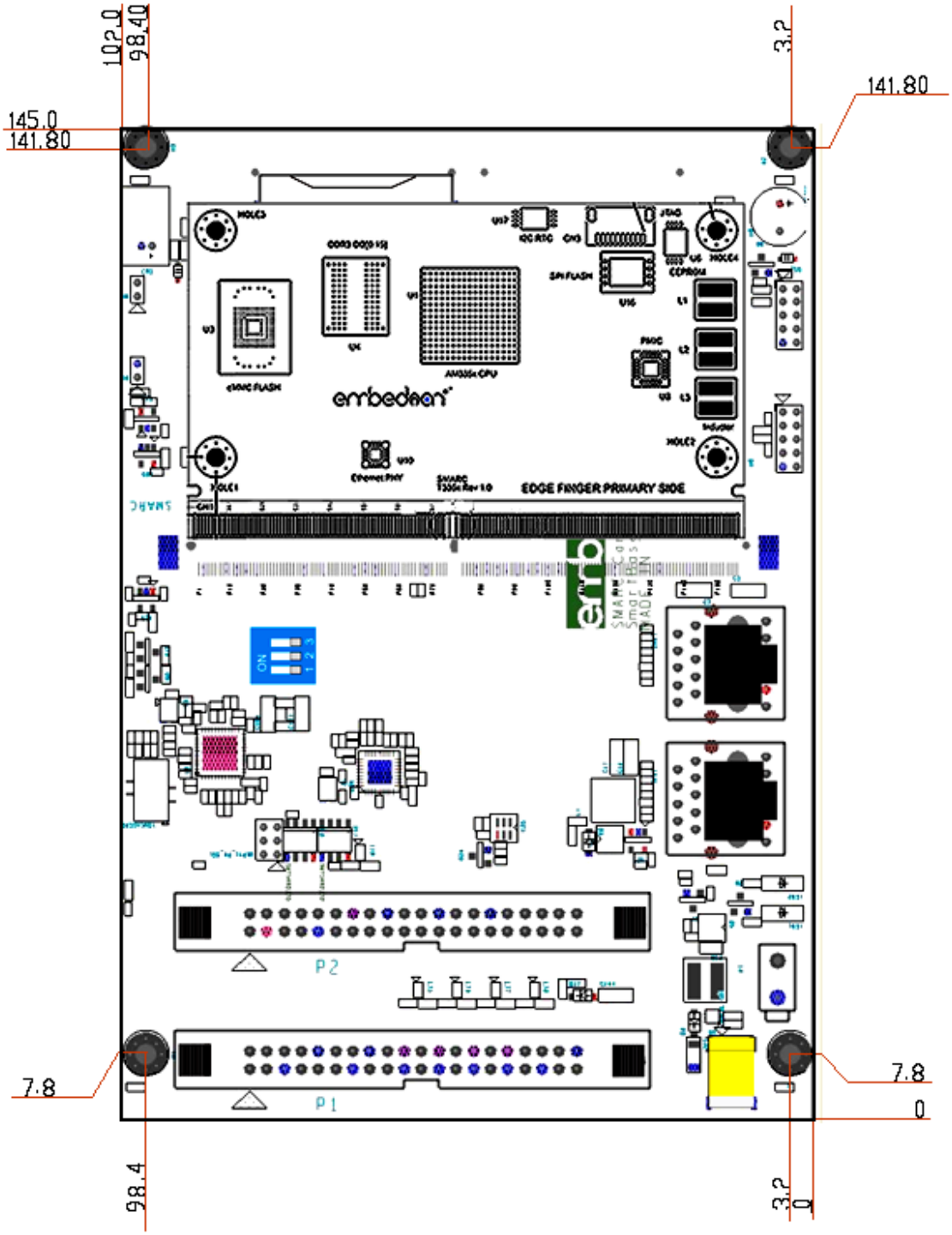


Figure 4: SBC-SMART-MEN Mounting Holes Mechanical Drawing Information

1.6 Document and Standard References

1.6.1. External Industry Standard Documents

- ***eMMC (Embedded Multi-Media Card)*** the eMMC electrical standard is defined by JEDEC JESD84-B45 and the mechanical standard by JESD84-C44 (www.jedec.org).
- ***The I2C Specification,*** Version 2.1, January 2000, Philips Semiconductor (now NXP) (www.nxp.com).
- ***I2S Bus Specification,*** Feb. 1986 and Revised June 5, 1996, Philips Semiconductor (now NXP) (www.nxp.com).
- ***JTAG (Joint Test Action Group*** defined by IEEE 1149.1-2001 - IEEE Standard Test Access Port and Boundary Scan Architecture (www.ieee.org).
- ***MXM3 Graphics Module Mobile PCI Express Module Electromechanical Specification,*** Version 3.0, Revision 1.1, © 2009 NVIDIA Corporation (www.mxm-sig.org).
- ***PICMG® EEEP Embedded EEPROM Specification,*** Rev. 1.0, August 2010 (www.picmg.org).
- ***SD Specifications Part 1 Physical Layer Simplified Specification,*** Version 3.01, May 18, 2010, © 2010 SD Group and SD Card Association (Secure Digital) (www.sdcard.org).
- ***SPI Bus –*** “Serial Peripheral Interface” - de-facto serial interface standard defined by Motorola. A good description may be found on Wikipedia (http://en.wikipedia.org/wiki/Serial_Peripheral_Interface_Bus).
- ***USB Specifications*** (www.usb.org).

1.6.2. Embedian Documents

The following documents are listed for reference. The schematic is not usually available outside of Embedian, without special permission. Contact your Embedian representative for more information.

- ***SBC-SMART-MEN User’s Manual***
- ***SBC-SMART-MEN Pinmux File***

1.6.3. TI Documents

- ***AM335x ARM Cortex-A8 Microprocessors (MPUs),*** April 15 2013 (rev. F)

- ***AM335x Schematic Checklist***, Oct 31 2011
- ***AM335x ARM Cortex-A8 Microprocessors (MPUs) Technical References Manual***, April 15 2013 (rev. H)
- ***AM335x Power Consumption Summary***, Oct 31 2011

1.6.4. TI Development Tools

- ***Pin Mux Utility for ARM® Microprocessors***
- ***Power Estimation Tool (PET)***

1.6.5. TI Software Documents

- ***LINUXEZSDK-AM335x***
- ***ANDROIDDEVKIT-JB-AM335x***

1.6.6. Embedian Software Documents

- ***SBC-SMART-MEN Linux BSP***
- ***SBC-SMART-MEN Android BSP***
- ***SBC-SMART-MEN Linux BSP User's Guide***
- ***SBC-SMART-MEN Android BSP User's Guide***

1.6.7. TI Design Network

- ***Beaglebone***
- ***Beaglebone Blask***
- ***Adeneo Embedded (Windows Embedded Compact 7)***
- ***Nucleus***
- ***QNX***

Jumpers, Switches and LEDs

This Chapter provides *SBC-SMART-MEN* jumpers, switches and LEDs information.

Section include：

- Jumpers
- Switches
- LEDs

Chapter 2 Jumpers, Switches and LEDs

This chapter gives detail information of the jumpers, switches and LEDs.

2.1 Jumpers

The *SBC-SMART-MEN* has a number of jumpers that allow you to configure your system to suit your application. All use 2mm shorting blocks (shunts) to select settings. Turn off power to the *SBC-SMART-MEN* before changing the position of a shunt.

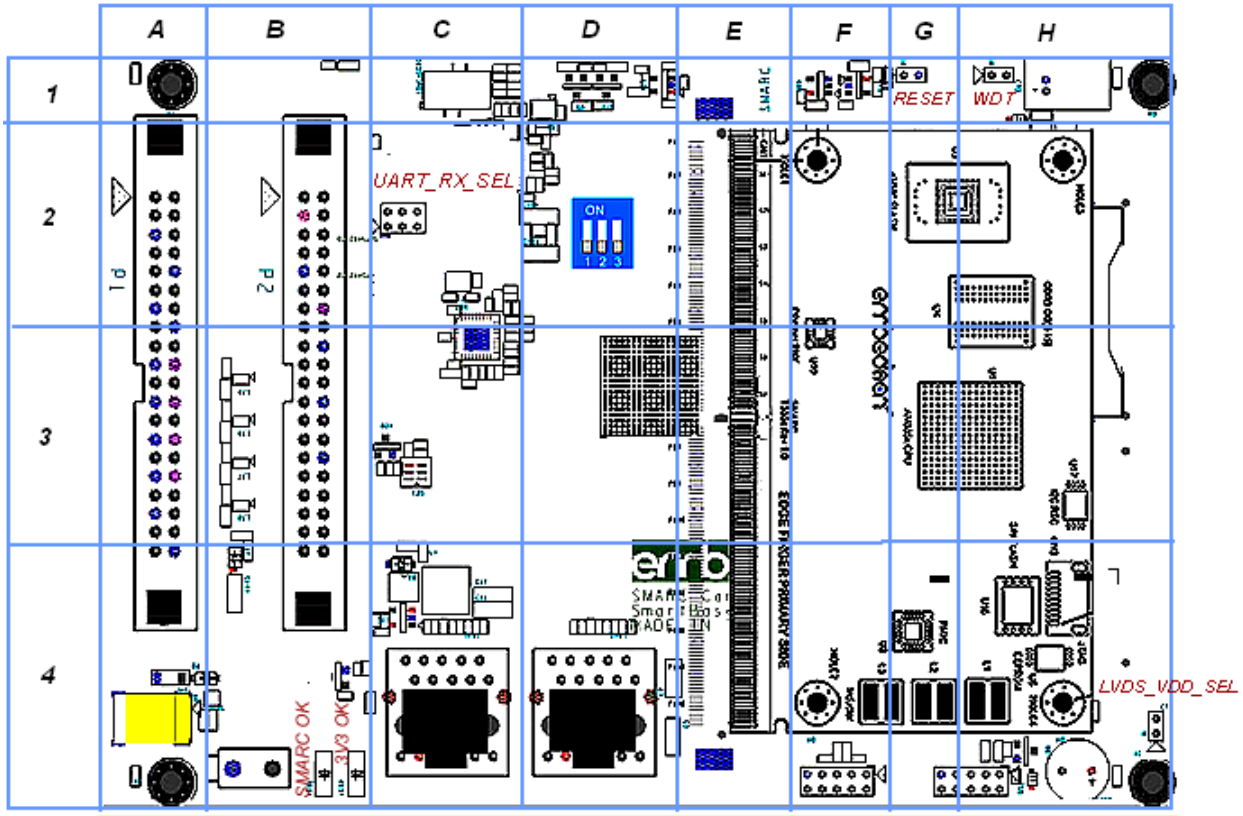


Figure 5: Jumper Locations

2.1.2. List of Jumpers

The table below lists the function of various jumpers.

Label	Function
LVDS_VDD_SEL	*3.3V/5V LCD Signaling Voltage*
UART_RX_SEL	*RS232/RS422/RS485 Setting for SER0 (UART0)*
RESET	*Hardware Reset*
WDT	*External WatchDog Timer*

2.1.3. Jumper Settings

The following tables describe how the jumper shunts to various configurations.

LVDS_VDD_SEL: *Location on Board, H4*

LVDS_VDD_SEL	3.3V/5V LCD Signaling Voltage	
	Setting	**Function**
	LVDS_VDD_SEL (1-2)	*3.3V*
	LVDS_VDD_SEL (2-3)	*5V*

UART_RX_SEL: *Location on Board, C2*

UART_RX_SEL	RS232/RS422/RS485 Settings	
	Setting	**Function**
	UART_RX_SEL (1-2)	*RS232*
	UART_RX_SEL (3-4)	*RS422/RS485 half duplex*
	UART_RX_SEL (5-6)	*RS422/RS485 full duplex*

RESET: *Location on Board, G1*

RESET	*Hardware Reset*	
	Setting	***Function***
	Shunt RESET and Release Immediately	*Hardware Reset*

WDT: *Location on Board, H1*

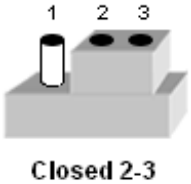
WDT	*External Watchdog Timer*	
	Setting	***Function***
	WDT Open	*Disable External WDT*
	WDT Closed	*Enable External WDT*

2.1.4. Setting Jumpers

You configure your board to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To “close” a jumper you connect the pins with the clip.
To “open” a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2 or 2 and 3.

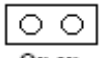
Open

Closed

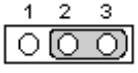


Closed 2-3

The jumper settings are schematically depicted in this manual as follows.


Open

Closed



Closed 2-3

A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact your sales representative before you make any change.

2.2 Switches

The *SBC-SMART-MEN* has one switch (SW1) that could determine the boot devices.

2.2.1. Switch Location

The SW1 switch for boot configuration is located at *D2* as shown in the following figure.

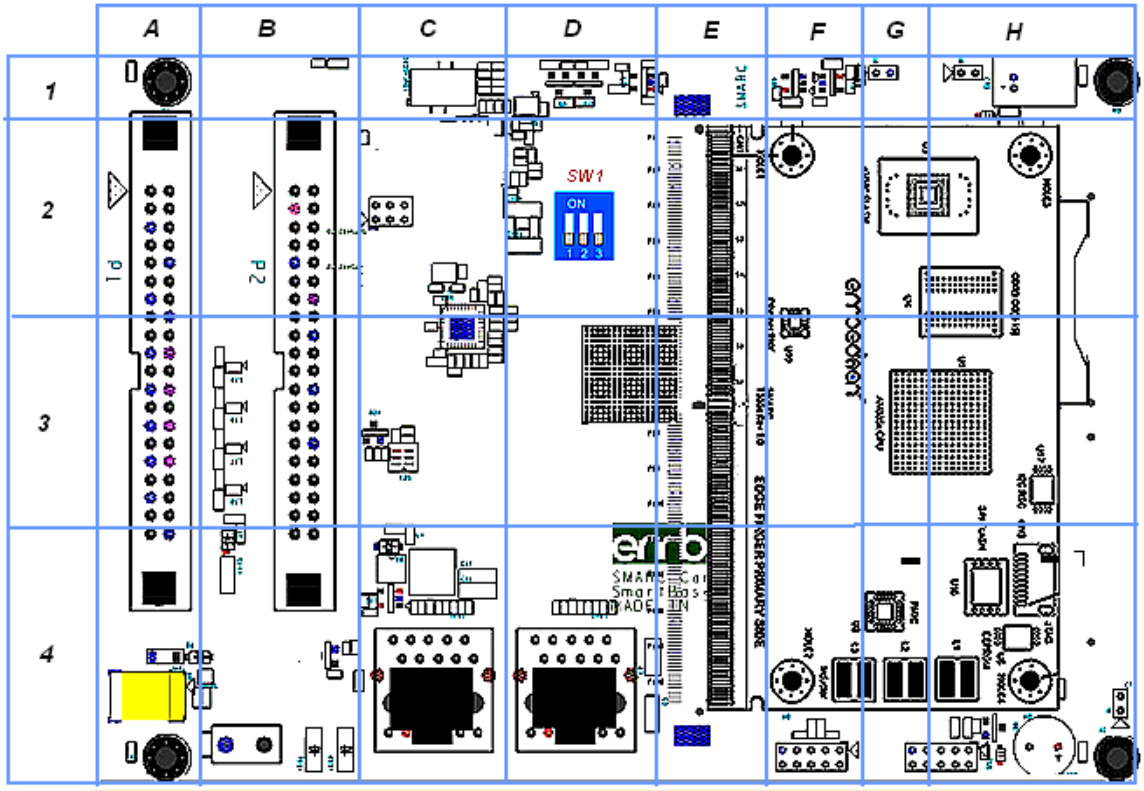


Figure 6: Switch Locations

2.2.2. List of Booting Device Configuration

The table below lists the booting device configuration setting by SW1.

SW1			Function
1	2	3	Boot Configuration
ON	OFF	OFF	Carrier SD Card
OFF	ON	ON	Module eMMC Flash
ON	ON	ON	Module SPI NOR Flash

2.3 LEDs

The *SBC-SMART-MEN* has two LEDs to indicate the power to SMARC module and 3.3V of carrier board power status. When power is fine, the LED will light on.

2.3.1. LEDs Location

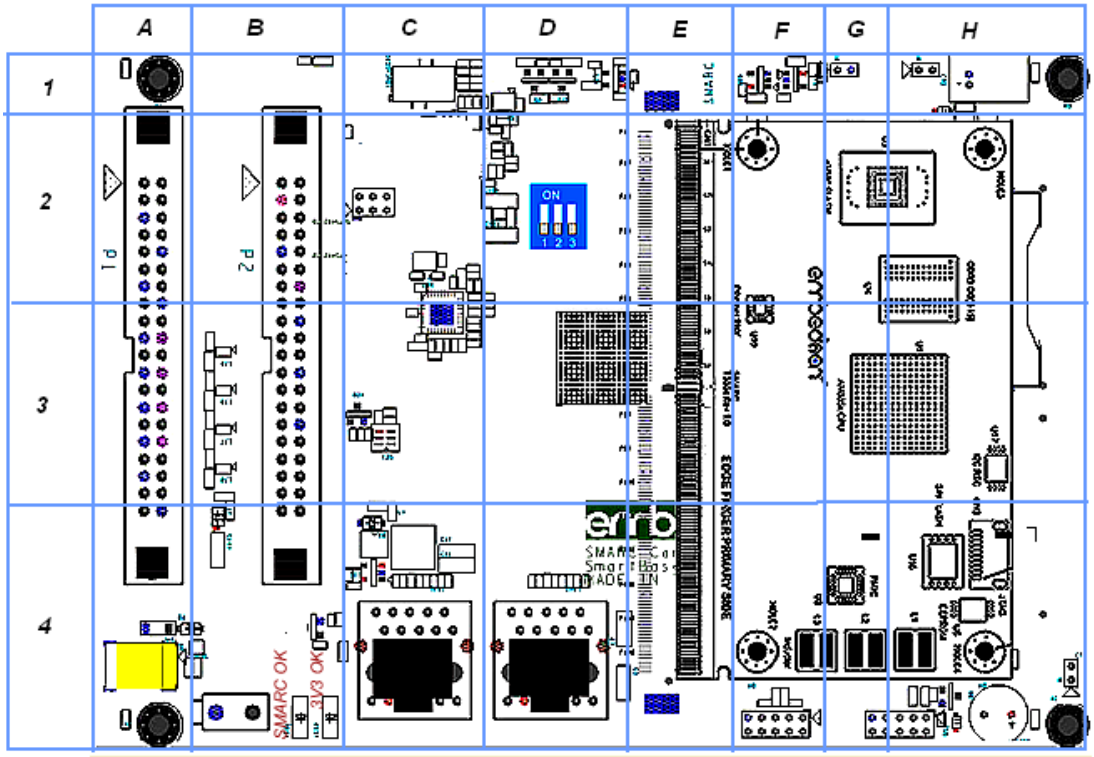


Figure 7: LED Locations

2.3.2. List of LEDs

The table below lists the function of LEDs.

Label	Function
SMARC OK	*ON, if power to SMARC module is fine*
3V3 OK	*ON, if 3.3V of carrier board is fine*

Connectors and Headers

This Chapter gives *SBC-SMART-MEN* connectors and headers detail information.

Section include：

- Connectors
- Headers

Chapter 3 Headers and Connectors

This section gives *SBC-SMART-MEN* connectors and headers detail information.

3.1 Connectors

Wired connections to the *SBC-SMART-MEN* single board computer are described in this section.

3.1.1. Connector Location

Top Side

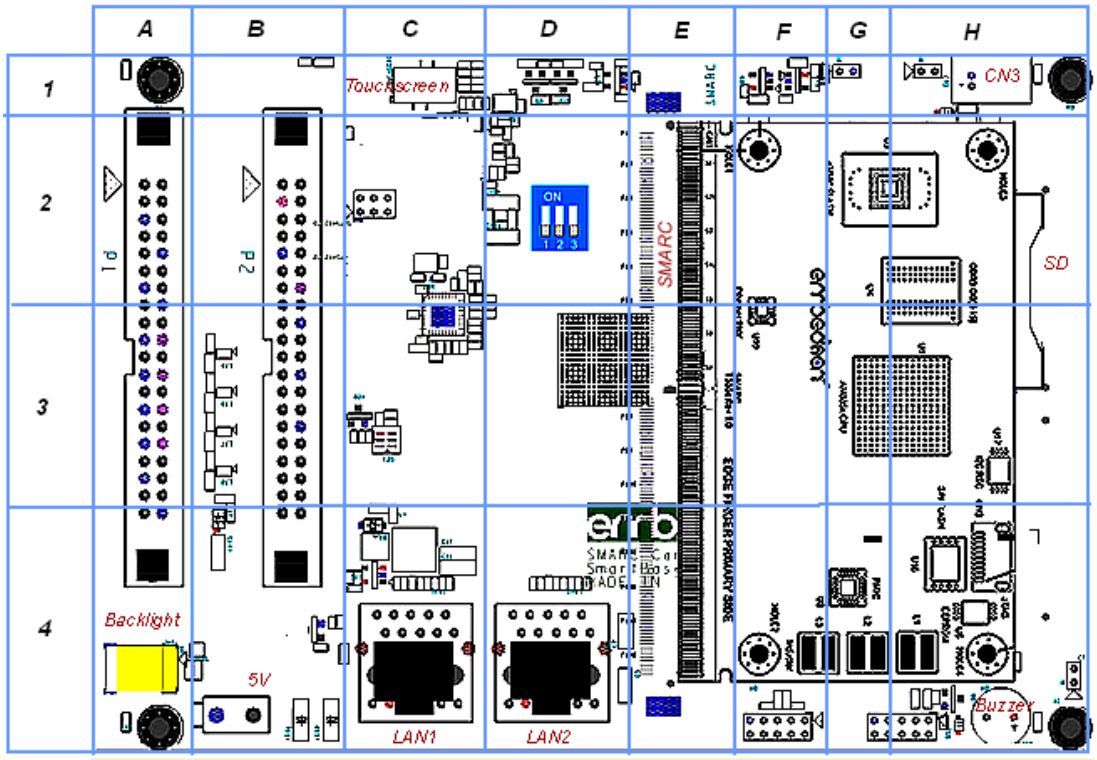


Figure 8: Connector Locations (Top Side)

Bottom Side

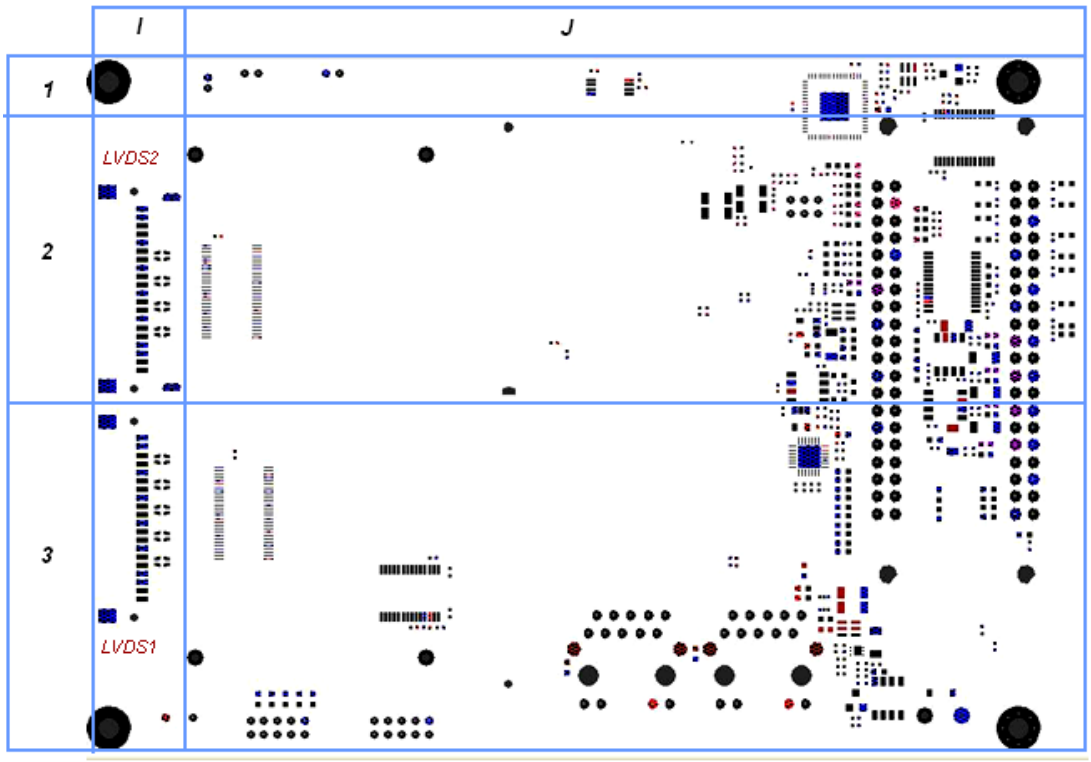


Figure 9: Connector Locations (Bottom Side)

3.1.2. List of Connectors

The table below lists the function of various connectors.

Label	Function
SMARC	*314-pin MXM3.0 SMARC Module Connector*
5V	*Power Input 2-pin 4.2mm mini fit male 180D*
Backlight	*LCD LED Backlight Connector*
Touchscreen	*4-wire Touch Connector*
CN3	*RTC Backup Battery*
SD	*SD/SDHC Connector*
Buzzer	*Buzzer*
LAN1	*LAN1 RJ45 Jack with Integrated Magnetic*
LAN2	*LAN2 RJ45 Jack with Integrated Magnetic*
LVDS1 (Bottom Side)	*24-bit Channel LVDS Connector*
LVDS2 (Bottom Side)	*18-bit Channel LVDS Connector*
CN3 (on Module)	*JTAG Connector*

3.1.3. Connector Pin Assignments

The following tables describe the electrical signals available on the connectors of the *SBC-SMART-MEN*. Each section provides relevant details about the connector including part numbers, mating connectors, signal descriptions and references to related chapters.

Pinout Legend

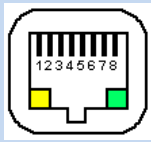
I	*Input*
O	*Output*
I/O	*Input or output*
P	*Power*
AI	*Analogue input*
AO	*Analogue output*
AIO	*Analogue Input or analogue output*
OD	*Open Drain Signal*
#	*Low level active signal*

3.1.3.1. Fast LAN RJ45 Connector: LAN1 and LAN2

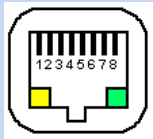
SBC-SMART-MEN provides with two vertical Fast Ethernet RJ45 connectors (LAN1 and LAN2).

The following table shows the pin-out of the LAN1 and LAN2 connectors.

LAN1: *Location on Board, C4*

	180D Vertical RJ45 Gigabit Connector			Edge Finger	Sitara AM335x CPU			Type
Header	Pin	Signal Name	Function	Pin#	Ball	Mode	Signal Name	
	1	GBE_MDI0+	Transmit Data+	P30	From SMSC LAN8720A			AO
	2	GBE_MDI0-	Transmit Data-	P29				AO
	3	GBE_MDI1+	Receive Data+	P27				AI
	4	GBE_MDI2+	Transmit Data+	P26				NC
	5	GBE_MDI2-	Transmit Data-	P24				NC
	6	GBE_MDI1-	Receive Data-	P23				AI
	7	GBE_MDI3+	Receive Data+	P20				NC
	8	GBE_MDI3-	Receive Data-	P19				NC
	L	Left LED	Duplex	P21/ P22				Yellow
	R	Right LED	Link and Ack	P25				Green

LAN2: *Location on Board, C5*

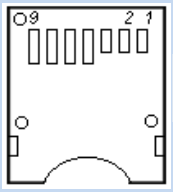
	180D Vertical Gigabit RJ45 Connector			Edge Finger	Sitara CPU AM335x			Type
Header	Pin	Signal Name	Function	Pin#	Ball	Mode	Signal Name	
	1	GBE1_MDI0+	Transmit Data+	S62	From SMSC LAN8720A			AO
	2	GBE1_MDI0-	Transmit Data-	S63				AO
	3	GBE1_MDI1+	Receive Data+	S65				AI
	4	GBE1_MDI2+	Transmit Data+	S66				NC
	5	GBE1_MDI2-	Transmit Data-	S68				NC
	6	GBE1_MDI1-	Receive Data-	S69				AI
	7	GBE1_MDI3+	Receive Data+	S71				NC
	8	GBE1_MDI3-	Receive Data-	S72				NC
	L	Left LED	Duplex	S23/ S24				Yellow
	R	Right LED	Link and Ack	S55				Green

3.1.3.2. SD/SDHC Connector: SD

SBC-SMART-MEN provides with one SD/SDHC connector (SD). The SD slot could be used as a boot device or as a standard storage.

The following table shows the pin-out of the SD/SDHC connector.

SD: *Location on Board, H2/H3*

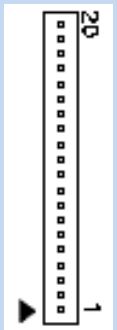
	SD/SDHC Connector			Edge Finger	Sitara AM335x CPU			Type
Header	Pin	Signal Name	Function	Pin#	Ball	Mode	Signal Name	
	1	SDIO_CD# /SDIO_D3	SD Insert Detect/ SD receive/transmit data	P35/ P42	U14/ F17	7/0	GPIO1 [18]/ MMC0_ DAT3	I/IO
	2	SDIO_CMD	SD receive response/ transmit command	P34	G18	0	MMC0_ CMD	O
	3	GND	Ground					P
	4	VDD_SD0	Power					P
	5	SDIO_CK	SD Clock	P36	G17	0	MMC0 _CLK	I
	6	GND	Ground					P
	7	SDIO_D0	SD receive/transmit data	P39	G16	0	MMC0_ DAT0	O
	8	SDIO_D1	SD receive/transmit data	P40	G15	0	MMC0_ DAT1	O
	9	SDIO_D2	SD receive/transmit data	P41	F18	0	MMC0_ DAT2	O
	10	SDIO_WP	SD Write Protect	P33	V14	7	GPIO1 [17]	I

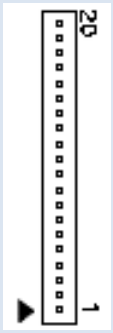
3.1.3.3. 24-bit LVDS Connector: LVDS1

SBC-SMART-MEN provides with one 24-bit LCD LVDS connector (LVDS1) and one 18-bit LCD LVDS connector (LVDS2).
For flat panel use, parallel LCD data and control information (Red, Green and Blue color data, Display Enable, Vertical Synch and Horizontal Synch) are serialized onto a set of LVDS differential pairs. The information is packed into frames that are 7 bits long. In this section, we will focus on 24-bit LVDS signals. For 24 bit color depths, four LVDS channels are used (24 data bits + 3 control bits + 1 unused bit = 28 bits, or 4 x 7) plus a clock pair. The LVDS clock is transmitted on a separate LVDS pair. The LVDS clock period is 7 times longer than the pixel clock period. The LVDS clock edges are off from the 7 bit frame boundaries by 2 pixel periods.
The LVDS signal is implemented from parallel RGB LCD signals via a TI SN75LVDS83B interface IC on carrier board.

The following table shows the pin-out of the LVDS1 LCD LVDS connector.

LVDS1: *Location on Board, I3 (Bottom Side)*

	LVDS Connector: *CONN. DF14-20P-1.25H			***Edge Finger***	***Sitara AM335x CPU***			***Type***
Header	*Pin*	*Signal Name*	*Function*	*Pin#*	*Ball*	*Mode*	*Signal Name*	
	*1*	*1*	*GND*					*P*
	2	*2*	*GND*					*P*
	3	*3*	*A3P*					*O*
	4	*4*	*A3M*					*O*
	5	*5*	*GND*					*P*
	6	*6*	*CLKP*					*O*
	7	*7*	*CLKM*					*O*
	8	*8*	*GND*					*P*
	9	*9*	*A2P*					*O*
	10	*10*	*A2M*					*O*
	11	*11*	*GND*					*P*

	LVDS Connector: *CONN. DF14-20P-1.25H			Edge Finger	Sitara AM335x CPU			Type
Header	Pin	Signal Name	Function	Pin#	Ball	Mode	Signal Name	
	12	12	A1P					O
	13	13	A1M					O
	14	14	GND					P
	15	15	A0P					O
	16	16	A0M					O
	17	17	GND					P
	18	18	GND					P
	19	19	VCC (3.3V or 5V)					P
	20	20	VCC (3.3V or 5V)					P

Note:

In the 24-bit single pixel mode, the RGB and control inputs shall be transmitted as shown in the following figure. Outputs A4 through A7 and CLK2 shall be inactive in this mode and fixed at a single value. Bits marked RES are reserved for future use and may take any value.

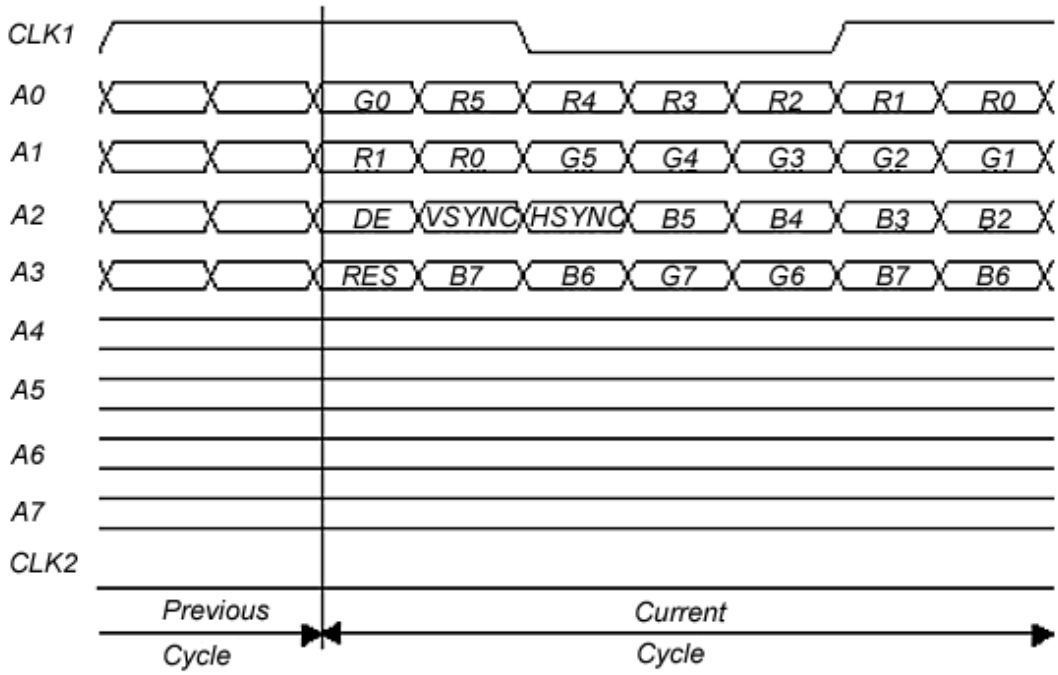


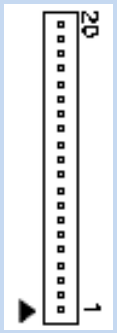
Figure 10: 24-bit Single Pixel Transmission, Unbalanced

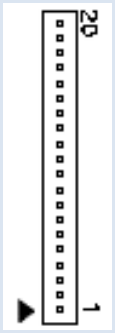
3.1.3.4. 18-bit LVDS Connector: LVDS2

In addition to 24-bit LVDS interface, *SBC-SMART-MEN* provides with the other 18-bit LCD LVDS connector (LVDS2). It is because that 18-bit LVDS panels and 24-bit LVDS panels are usually not compatible. For 18 bit color depths, the data and control information utilize three LVDS channels (18 data bits + 3 control bits = 21 bits; hence 3 channels with 7 bit frames) plus a clock pair.
The LVDS signal is implemented from parallel RGB LCD signals via another TI SN75LVDS83B interface IC on carrier board.

The following table shows the pin-out of the LVDS1 LCD LVDS connector.

LVDS1: *Location on Board, I2 (Bottom Side)*

	LVDS Connector: *CONN. DF14-20P-1.25H			***Edge Finger***	***Sitara AM335x CPU***			***Type***
Header	*Pin*	*Signal Name*	*Function*	*Pin#*	*Ball*	*Mode*	*Signal Name*	
	*1*	*1*	*GND*					*P*
	2	*2*	*GND*					*P*
	3	*3*	*NC*					*NC*
	4	*4*	*NC*					*NC*
	5	*5*	*GND*					*P*
	6	*6*	*CLKP*					*O*
	7	*7*	*CLKM*					*O*
	8	*8*	*GND*					*P*
	9	*9*	*A2P*					*O*
	10	*10*	*A2M*					*O*
	11	*11*	*GND*					*P*
	12	*12*	*A1P*					*O*
	13	*13*	*A1M*					*O*
	14	*14*	*GND*					*P*

	LVDS Connector: *CONN. DF14-20P-1.25H			Edge Finger	Sitara AM335x CPU			Type
Header	Pin	Signal Name	Function	Pin#	Ball	Mode	Signal Name	
	15	15	A0P					O
	16	16	A0M					O
	17	17	GND					P
	18	18	GND					P
	19	19	VCC (3.3V or 5V)					P
	20	20	VCC (3.3V or 5V)					P

Note:

In the 18-bit single pixel mode, the RGB and control inputs shall be transmitted as shown in the following figure. Outputs A3 through A7 and CLK2 shall be inactive in this mode and fixed at a single value.

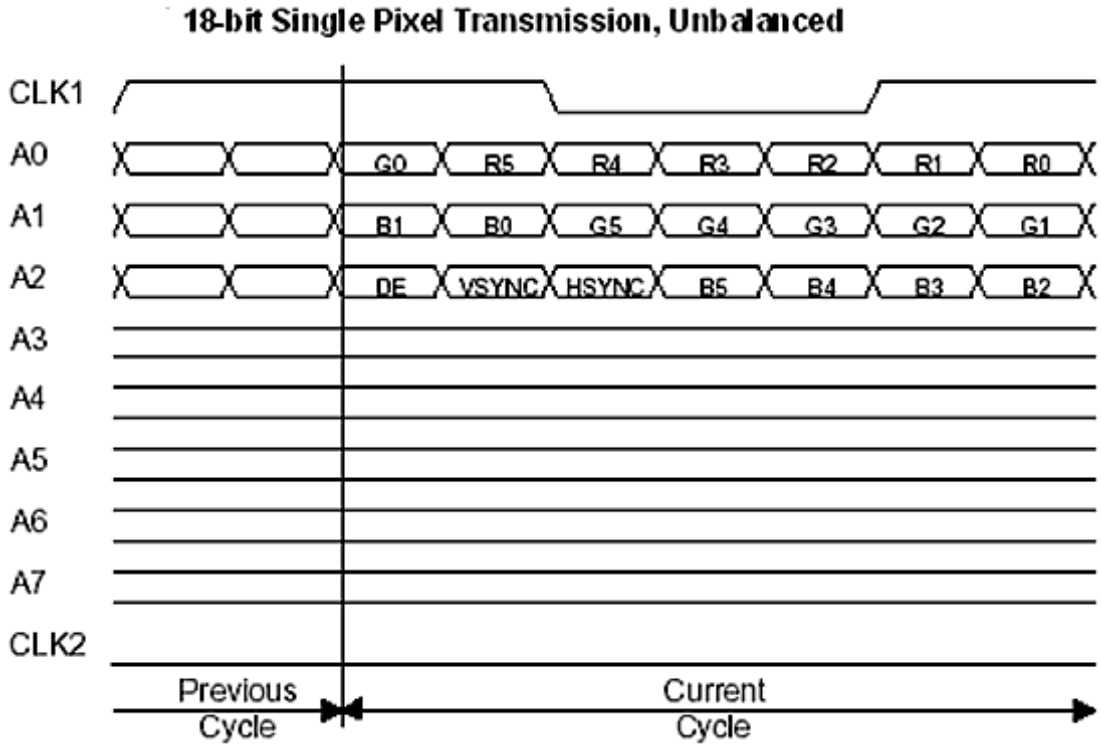


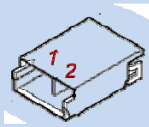
Figure 11: 18-bit Single Pixel Transmission, Unbalanced

3.1.3.5. LCD LED Backlight Connector: Backlight

SBC-SMART-MEN provides with one LCD LED backlight connector (*Backlight*) that can drive up to 10 LEDs in series. The driver IC is TI *TPS61165*.

The following table shows the pin-out of the LED backlight connector.

Backlight: *Location on Board, A4*

	LED Backlight Connector: ***JST SM02B-BHSS-1-TB or compatible***			***Edge Finger***	***Sitara AM335x CPU***			***Type***
Header	*Pin*	*Signal Name*	*Function*	*Pin#*	*Ball*	*Mode*	*Signal Name*	
	*1*	*BLH*	*Backlight Drive (Anode Side)*		*From TPS61165*			*P*
	2	*BLL*	*Backlight Drive (Cathode Side)*		*From TPS61165*			*P*

Note:

The mating connector is JST *BHSR-02VS-1* or compatible.

3.1.3.6. Power Input 2-pin 4.2mm mini fit male 180D Connector: 5V

The power input connector of *SBC-SMART-MEN* is using a 2-pin 4.2mm locking ramp Molex 39-28-1023 or compatible connectors. The input power shall be 5V.
The following table shows the pin-out of the power input connector.

5V: *Location on Board, B4*

	Power Input Connector: 2-pin screw type terminal block			Edge Finger	Sitara AM335x CPU			Type
Header	Pin	Signal Name	Function	Pin#	Ball	Mode	Signal Name	
	1	5V	5V Input					P
	2	GND	Ground Power					P

3.1.3.7. SMARC Module MXM3 Connector: SMARC

The SMARC Module is supported on SMARC connector. This is a 314 pin MXM3 style connector. The SMARC pin-out conforms to the SMARC Module specification. Only 3.3V Module I/O can be supported on the *SBC-SMART-MEN* single board computer.

The MXM3 style connector used on the *SBC-SMART-MEN* single board computer is with a board-to-board spacing of 5mm.

The *SBC-SMART-MEN* carrier board has captive M2.5 threaded standoffs in the SMARC mounting hole positions. The standoffs accept M2.5 screws, inserted from above, through the Module holes.

3.1.3.8. RTC Backup Battery: CN3

A 6.8mm diameter 3V lithium coin cell battery is available in position CN3. The part number of coin cell battery on CN3 is *Seiko MS621F_FL11E*.

The battery '+' terminal is protected against charging (as required by safety regulations) by a Schottky diode and a 49.9 Ohm resistor (R10).

CN3: *Location on Board, H1*

3.1.3.9. 4-wire Touch Connector: Touchscreen

SBC-SMART-MEN provides with a 4-wire FPC connector for touch panel. The controller is from ADC of the processor.

The following table shows the pin-out of the Touchscreen 4-wire resistive connector.

Touchscreen: *Location on Board, C1*

	4-wire Touch Connector: 1.0 ZIF FPC SMT V/T			***Edge Finger***	***Sitara AM335x CPU***			***Type***
Header	*Pin*	*Signal Name*	*Function*	*Pin#*	*Ball*	*Mode*	*Signal Name*	
	1	*XNUR*	*Left*	*S21*	*C7*		*AIN1*	*AI*
	2	*YPLL*	*Bottom*	*S19*	*B7*		*AIN2*	*AI*
	3	*XPUL*	*Right*	*S18*	*B6*		*AIN0*	*AI*
	4	*YNLR*	*Top*	*S22*	*A7*		*AIN3*	*AI*

Note:

The length of touch FPC cable should not be keeping too long.

3.1.3.10. Buzzer: Buzzer

The buzzer on *SBC-SMART-MEN* is controlled by *PWM* (*GPIO10*). The rated frequency is 2731 + 200Hz.

Buzzer: *Location on Board, H4*

	Power Input Connector: ***2-pin screw type terminal block***			***Edge Finger***	***Sitara AM335x CPU***			***Type***
Header	*Pin*	*Signal Name*	*Function*	*Pin#*	*Ball*	*Mode*	*Signal Name*	
	1	*VDD*	*3.3V*					*P*
	2	*GPIO10*	*PWM*	*P118*	*C14*	*Mode7*	*GPIO3[7]*	*O*

3.1.3.11. JTAG Connector: CN3 on Module

JTAG functions for CPU debug and test are implemented on separate small form factor connector (CN3: *JST SM10B-SRSS-TB*, 1mm pitch R/A SMD Header) on SMARC module. The JTAG pins are used to allow test equipment and circuit emulators to have access to the Module CPU. The pin-outs shown below are used:

The following table shows the pin-out of the CN3 (on module) JTAG connector.

CN3: *Location on Board, D4*

	JTAG Connector: ***JST SM10B-SRSS-TB, 1mm pitch R/A SMD Header***			***Edge Finger***	***Sitara AM335x CPU***			***Type***
Header	*Pin*	*Signal Name*	*Function*	*Pin#*	*Ball*	*Mode*	*Signal Name*	
	1	*VDD_33A*	*JTAG I/O Voltage (sourced by Module)*					*P*
	2	*nTRST*	*JTAG Reset, active low*	*B10*		*nTRST*	*B10*	*I*
	3	*TMS*	*JTAG mode select*	*C11*		*TMS*	*C11*	*I*
	4	*TDO*	*JTAG data out*	*A11*		*TDO*	*A11*	*O*
	5	*TDI*	*JTAG data in*	*B11*		*TDI*	*B11*	*I*
	6	*TCK*	*JTAG clock*	*A12*		*TCK*	*A12*	*I*
	7	*RTCK*	*JTAG return clock*					*I*
	8	*GND*	*Ground*					*P*
	9	*MFG_Mode#*	*Pulled low to allow in-circuit SPI ROM update*					*I*
	10	*GND*	*Ground*					*P*

Note:

The mating connector part number is JST 10SR-3S.

3.2 Headers

This section details the header information of *SBC-SMART-MEN* single board computer.

3.2.1. Header Location

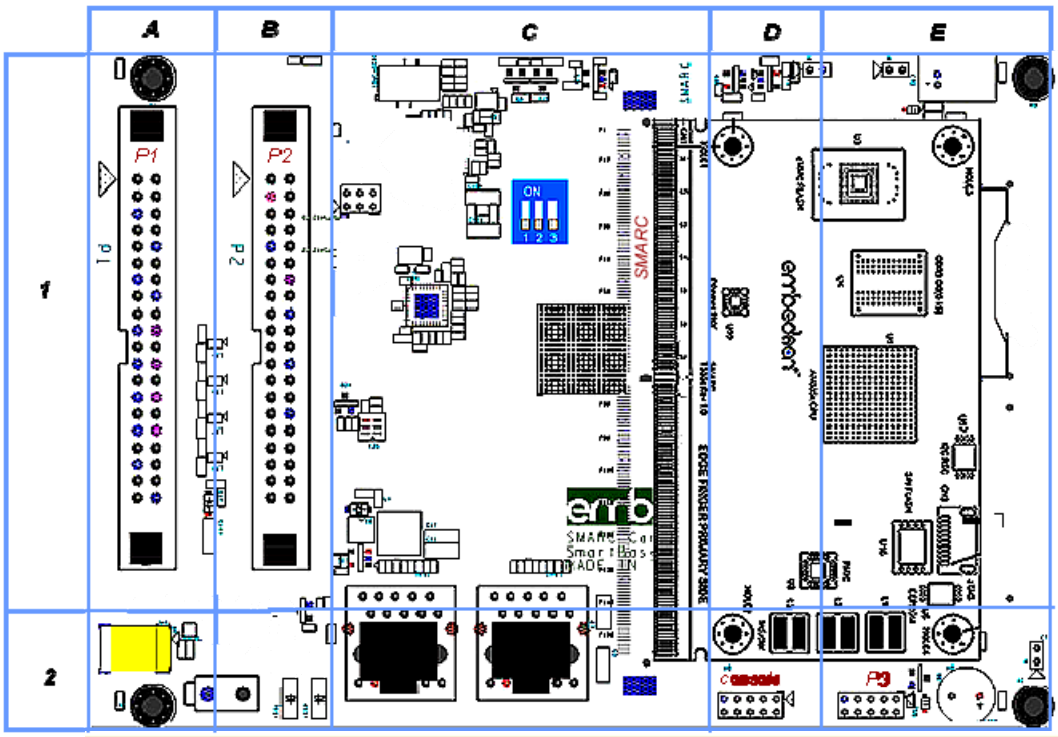


Figure 12: Header Locations

3.2.2. List of Headers

The table below lists the function of various headers.

Label	Function
Console	*Debug Port*
P3	*SPI1, GPIO11*
P1	*5 x RS232s, 3 x USB Host 2.0, Serial-to-USB_Client, I2C_GP*
P2	*RS422/485, Audio Mic. In and Headset Out, USB OTG, SPI0, CAN Bus, I2C_LCD, 11 x GPIO*

3.2.3. Header Pin Assignments

The following tables describe the electrical signals available on the connectors of the *SBC-SMART-MEN*. Each section provides relevant details about the connector including part numbers, mating connectors, signal descriptions and references to related chapters.

Pinout Legend

I	*Input*
O	*Output*
I/O	*Input or output*
P	*Power*
AI	*Analogue input*
AO	*Analogue output*
AIO	*Analogue Input or analogue output*
OD	*Open Drain Signal*
#	*Low level active signal*

3.2.3.1. Serial Console Debug Connector: Console

SBC-SMART-MEN provides with one serial console port that using 2x05 2.0mm box header as the connector. The serial console port is available through a 2.0mm 2x05 header (Console). A 10-way box header to DB9 cable with 20cm long comes with the first-time purchase only and is shown as follows.

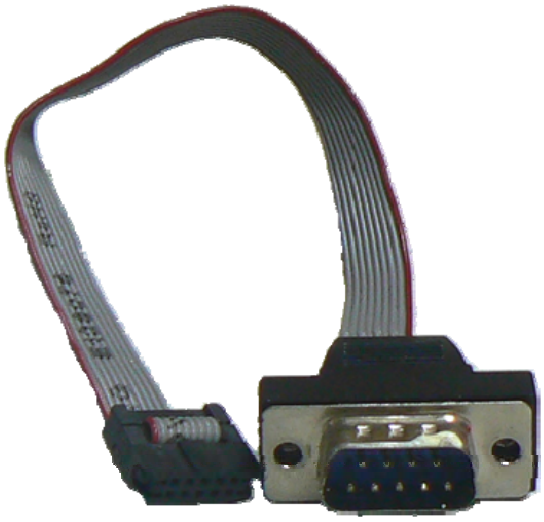


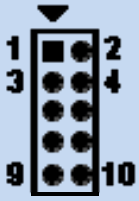
Figure 13: 10-way box header to DB9 cable

Note:

The red line on the cable should align to pin 1 of the header.

The following table shows the pin-out of the console serial port header.

Console: *Location on Board, D2*

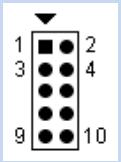
	RS232 Header: HEADER DIP 10*2P 180D MALE 2.0mm			***Edge Finger***	***Sitara AM335x CPU***			***Type***
Header	*Pin*	*Signal Name*	*Function*	*Pin#*	*Ball*	*Mode*	*Signal Name*	
	*1*	*NC*						
	2	*NC*						
	3	*SER3_RX*	*Receive Data*	*P135*	*K18*	*1*	*UART3_RXD*	*I*
	4	*NC*						
	5	*SER3_TX*	*Transmit Data*	*P134*	*L18*	*1*	*UART3_TXD*	*O*
	6	*NC*						
	7	*NC*						
	8	*NC*						
	9	*GND*						*P*
	10	*NC*						

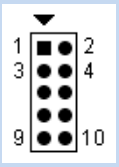
3.2.3.2. P3 Header: P3

The P3 header of *SBC-SMART-MEN* reserves SPI1 and GPIO11 function.

The following table shows the pin-out of the P3 header.

P3: *Location on Board, E2*

Header	CAN Bus Header: HEADER DIP 10*2P 180D MALE 2.0mm			Edge Finger	Sitara AM335x CPU			Type
	Pin	Signal Name	Function	Pin#	Ball	Mode	Signal Name	
	1	VDD_ GPIO						P
	2	SPI1_ CS0#	SPI1 Master Chip Select 0 output	P54	C12	3	SPI1_CS0	O
	3	GPIO11	GPIO	P119	B14	7	GPIO3[8]	I/O
	4	SPI1_ CS1#	SPI1 Master Chip Select 1 output	P55	A15	4	SPI1_CS1	O
	5	NC						
	6	SPI1_ SCLK	SPI1 Master Clock output	P56	A13	3	SPI1_SCLK	O

	CAN Bus Header: HEADER DIP 10*2P 180D MALE 2.0mm			Edge Finger	Sitara AM335x CPU			Type
Header	Pin	Signal Name	Function	Pin#	Ball	Mode	Signal Name	
	7	NC						
	8	SPI1_ MOSI	SPI1 Master Data output (output from CPU, input to SPI device)	P58	D12	3	SPI1_D1	O
	9	GND						P
	10	SPI1_ MISO	SPI1 Master Data input (input to CPU, output from SPI device)	P57	B13	3	SPI1_D0	I

3.2.3.3. P1 Header: P1

The P1 header of *SBC-SMART-MEN* mainly integrates *5 RS232s, 3 USB Host 2.0* and one *serial-to-USB* (client) and *I2C_GP* (can be configured as 2 GPIOs). The connector type is *20*2P Box Header 180D MALE 2.54mm*.

The following table shows the pin-out of the P1 header. The pin order of P1 and P2 header are as follows.

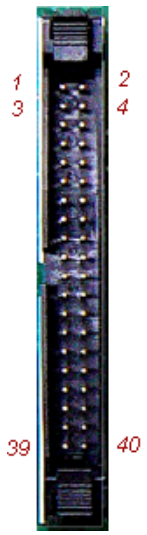


Figure 14: Pin Order of P1 and P2 Connector

P1: *Location on Board, A1*

P1 Connector (2 x20 2.54mm box header 180 dip)		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
SER1 (from CP2108): RS232						
1	RXD1				I	Receive Data
2	RTS1				O	Ready to Send
3	TXD1				O	Transmit Data
4	CTS1				I	Clear To Send
5	GND1				P	Ground
SER2 (from CP2108): RS232						
6	RXD2				I	Receive Data
7	RTS2				O	Ready to Send
8	TXD2				O	Transmit Data
9	CTS2				I	Clear To Send
10	GND2				P	Ground

P1 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
SER3 (from CP2108): RS232						
11	RXD3				I	Receive Data
12	TXD3				O	Transmit Data
13	GND3				P	Ground
SER4 (from CP2108): RS232						
14	RXD4				I	Receive Data
15	TXD4				O	Transmit Data
16	GND4				P	Ground
SER5 (from CPU UART1): RS232						
17	RXD5				I	Receive Data
18	TXD5				O	Transmit Data
19	GND5				P	Ground

P1 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
USB1 Host 2.0						
20	USB1_5V *				P	USB1 -supply (max. 500mA)
21	USB1-				IO	Universal serial bus port 1 (-)
22	USB1+				IO	Universal serial bus port 1 (+)
23	USB1_GND				P	USB Ground
USB2 Host 2.0						
24	USB2_5V *				P	USB2 -supply (max. 500mA)
25	USB2-				IO	Universal serial bus port 3 (-)
26	USB2+				IO	Universal serial bus port 3 (+)
27	USB2_GND				P	USB Ground
USB3 Host2.0						
28	USB3_5V *				P	USB3 -supply (max. 500mA)
29	USB3-				IO	Universal serial bus port 3 (-)
30	USB3+				IO	Universal serial bus port 3 (+)
31	USB3_GND				P	USB Ground

P1 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
Serial (CPU UART0 and CP2102) to USB Client						
32	SERIAL_USB_5V				P	USB -supply (max. 500mA)
33	SERIAL_USB-				IO	Universal serial bus port (-)
34	SERIAL_USB+				IO	Universal serial bus port (+)
35	USB_GND				P	USB Ground
36	NC					Not Connected
GPIO (I2C1)						
37	GPIO (I2C_GP_CK)	D17	Mode7	GPIO0_15	OD	LCD display I2C bus clock
38	GPIO (I2C_GP_DAT)	D16	Mode7	GPIO0_14	OD	General purpose I2C bus data
39	VDD_GPIO				P	GPIO Power
40	GND_GPIO				P	GPIO Ground

3.2.3.4. P2 Header: P2

The P2 header of *SBC-SMART-MEN* defines *RS422/485, USB OTG, Audio Mic. Input* and *Headset Output, I2C_LCD, CAN Bus, SPI0,* and *10 GPIOs*. The connector type is also *20*2P Box Header 180D MALE 2.54mm*.

P2: *Location on Board, B1*

P2 Connector (2 x20 2.54mm box header 180 dip)		***Sitara AM335x CPU***			***Type***	***Description***
Pin#	*Pin Name*	*Ball*	*Mode*	*Signal Name*		
Audio						
1	*HP_OUT_R*				*AO*	*Right channel of headset speaker*
2	*HP_OUT_RR*				*AO*	*HPRCOM Signal of AIC3106*
3	*AGND*				*AGND*	*Analog Ground*
4	*HP_OUT_L*	*From TLV320AIC3016 Audio Codec*				*Left channel of headset speaker out*
5	*HP_OUT_LR*					*HPLCOM Signal of AIC3106*
6	*AUD_33*				*AI*	*Analogue VDD_IO*
7	*MIC_R*				*AI*	*Right channel of microphone input*
8	*MIC_L*				*AI*	*Left channel of microphone input*

P2 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
RS422/485						
9	GND					Ground
10	UART1_422_TX+_485+					RS422 transmit plus or RS485 plus
11	UART1_422_TX-_485-					RS422 transmit minus or RS485 minus
12	UART1_422_RX+					RS422 receive plus
13	UART1_422_RX-					RS422 receive minus

P2 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
USB OTG						
14	USB0_VBUS				P	Power Supply
15	USB0-	N18	0	USB0_DM	IO	Data-
16	USB0+	N17	0	USB0_DP	IO	Data+
17	USB0_OTG_ID	P16	0	USB0_ID	IO	Host cable identification
18	GND				P	Ground

P2 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
SPI0						
19	SPI0_ CS0#	A16	0	SPI0_CS0	O	SPI0 Master Chip Select 0 output
20	SPI0_ CS1#	C15	0	SPI0_CS1	O	SPI0 Master Chip Select 1 output
21	SPI0_ SCLK	A17	0	SPIO_SCLK	O	SPI0 Master Clock output
22	SPI0_ MOSI	B16	0	SPI0_D1	O	SPI0 Master Data output (output from CPU, input to SPI device)
23	SPI0_ MISO	B17	0	SPI1_D0	O	SPI0 Master Data input (input to CPU, output from SPI device)

P2 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
CAN Bus						
24	GND				P	Ground
25	CAN0H	J18	1	DCAN0_TX	O	CAN Signal High
26	CAN0L	K15	1	DCAN0_RX	I	CAN Signal Low

P2 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
I2C_LCD						
27	I2C_LCD_CK	D17	3	I2C2_SCL	OD	LCD display I2C bus clock
28	I2C_LCD_DAT	D18	3	I2C2_SDA	OD	LCD display I2C bus data

P2 Connector		Sitara AM335x CPU			Type	Description
Pin#	Pin Name	Ball	Mode	Signal Name		
GPIO						
29	VDD_ GPIO				P	GPIO Power
30	GND				P	Ground
31	GPIO0	J17	7	GPIO3[4]	IO	GPIO
32	GPIO1	T6	7	GPIO2[5]	IO	GPIO
33	GPIO2	U16	7	GPIO1[25]	IO	GPIO
34	GPIO3	V16	7	GPIO1[24]	IO	GPIO
35	GPIO4	U6	7	GPIO2[4]	IO	GPIO
36	GPIO5	T7	7	GPIO2[3]	IO	GPIO
37	GPIO6	U18	7	GPIO1[28]	IO	GPIO
38	GPIO7	V6	7	GPIO1[29]	IO	GPIO
39	GPIO8	T13	7	GPIO2[0]	I/O	GPIO
40	GPIO9	V12	7	GPIO2[1]	I/O	GPIO

I2C0 Devices and EEPROM Format

This Chapter points out the I2C0 device information and EEPROM format.
Section include：

- I2C Devices on Carrier
- Module EEPROM Format
- Carrier EEPROM Format

Chapter 4 I2C0 Devices and Carrier EEPROM Format

This chapter introduces I2C0 devices on *SBC-SMART-MEN*. Also, EEPROM format on carrier board will also be introduced.

4.1 I2C0 Devices

There are five I2C devices on the *SBC-SMART-MEN* and are all on the *I2C_PM* (*I2C0*) bus and are operated at 3.3V. Those devices and their address details are listed in the following table:

#	Device	Description	Address (7-bit)	Address (8-bit)		Notes
				Read	Write	
I2C_PM Bus						
1	TI TPS65217C	PMIC	0x24	0x49	0x48	General purpose usage address
2	On Semiconductor CAT64C32	EEPROM	0x50	0xA1	0xA0	General purpose parameter EEPROM, Serial number, etc in PICMG EEEP format
3	Seiko S-35390A	Real-time clock IC	0x30	0x61	0x60	General purpose parameter with INT1 register access
4	TI TLV320AIC3106	Audio Codec	0x1B	0x37	0x36	General purpose usage address
5	On Semiconductor CAT64C32	EEPROM	0x57	0xAF	0xAE	General purpose parameter EEPROM, Serial number, etc in PICMG EEEP format

4.2 Module EEPROM Format

The SMARC module on *SBC-SMART-MEN* includes an I2C serial EEPROM available on the I2C_PM bus. An On Semiconductor 24C32 or equivalent EEPROM is used in the module. The device operates at 1.8V. The Module serial EEPROM is placed at I2C slave addresses A2 A1 A0 set to 0 (I2C slave address 50 hex, 7 bit address format or A0 / A1 hex, 8 bit format) (for I2C EEPROMs, address bits A6 A5 A4 A3 are set to binary 0101 convention).

The module serial EEPROM is intended to retain module parameter information, including serial number. The module serial EEPROM data structure conforms to the PICMG® EEEP Embedded EEPROM Specification.

The EEPROM ID memory layout is now follow the mainline and as follows.

Name	Size (Bytes)	Contents
Header	4	MSB 0xEE3355AA LSB
Board Name	8	Name for Board in ASCII “SMARCT33” = Embedian SMARC T335X Computer on Module
Version	4	Hardware version code for version in ASCII “00A0” = rev. A0
Serial Number	12	Serial number of the board. This is a 12 character string which is: WWYYMS60nnnn Where: WW = 2 digit week of the year of production YY = 2 digit year of production 60 = 600Mhz nnnn = incrementing board number
Configuration Option	32	Codes to show the configuration setup on this board. For the available T335X supported, the following codes are used: ASCII = “SMARCT33” = default configuration Remaining 24 bytes are reserved
Available	32720	Available space for other non-volatile codes/data

4.3 Carrier EEPROM Format

The *SBC-SMART-MEN* carrier board includes an I2C serial EEPROM available on the I2C_PM bus. An On Semiconductor 24C32 or equivalent EEPROM is used in the Carrier. The device operates at 3.3V. The Module serial EEPROM is placed at I2C slave addresses A2 A1 A0 set to 1 (I2C slave address 57 hex, 7 bit address format or A0 / A1 hex, 8 bit format) (for I2C EEPROMs, address bits A6 A5 A4 A3 are set to binary 0101 convention).

The Carrier serial EEPROM is intended to retain carrier parameter information, including serial number. The carrier serial EEPROM data structure conforms to the PICMG® EEEP Embedded EEPROM Specification.

Note:
The EEPROM ID memory layout is now follow the mainline and as follows.

Name	*Offset*	*Size (bytes)*	*Contents*
Header	*0*	*4*	*0xAA, 0×55, 0×33, 0xEE*
EEPROM Format Revision	*4*	*2*	*Revision number of the overall format of this EEPROM in ASCII =A0*
Board Name	*6*	*32*	*Name of board in ASCII*
Version	*38*	*4*	*Hardware version code for board in ASCII*
Manufacturer	*42*	*16*	*ASCII name of the manufacturer*
Part Number	*58*	*16*	*ASCII Characters for the part number*
Number of Pins	*74*	*2*	*Number of pins used by the daughter board*

Name	Offset	Size (bytes)	Contents
Serial Number	76	12	Serial number of the board. This is a 12 character string which is: WWYYCSMEnnnn Where: WW = 2 digit week of the year of production YY = 2 digit year of production nnnn = incrementing board number
Pin Usage	88	148	Two bytes for each configurable 74 pins on the expansion connectors Bit 15: Pin is used or not; 0=Unused by Cape 1=Used by Cape Bit 14-13: Pin Direction; 1 0=Output 01=Input 11=BDIR Bits 12-7: Reserved Bit 6: Slew Rate; 0=Fast 1=Slow Bit 5: Rx Enable; 0=Disabled 1=Enabled Bit 4: Pull Up/Dn Select; 0=Pulldown 1=PullUp Bit 3: Pull Up/DN enabled; 0=Enabled 1=Disabled Bits 2-0: Mux Mode Selection; Mode 0-7
VDD_3V3EXP Current	236	2	Maximum current in milliamps
VDD_5V Current	238	2	Maximum current in milliamps
SYS_5V Current	240	2	Maximum current in milliamps
DC Supplied	242	2	Indicates whether or not the board is supplying voltage on the VDD_5V rail and the current rating 000=No 1-0xFFFF is the current supplied
Available	244	32543	Available space for other non-volatile codes/data

Quick Start Guide

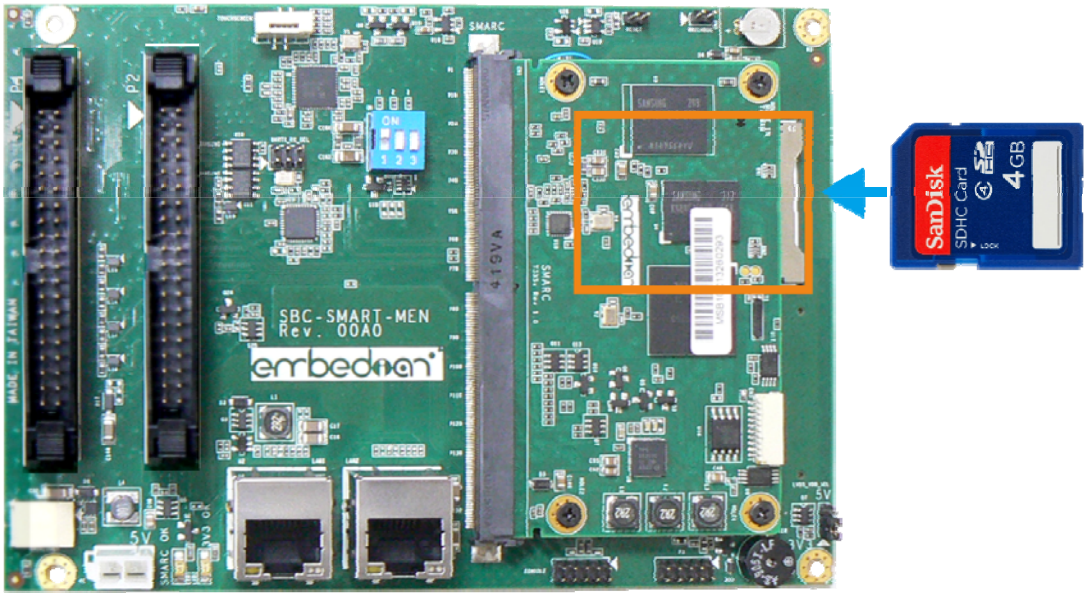
The purpose of this chapter is to provide a quick start guide so that developers can easily get the board up and running in few minutes.

Chapter 5 Quick Start Guide

These quick start guides are intended to provide developers with simple instructions on how to install *SBC-SMART-MEN* from very beginning and have it monitoring your local device in few minutes. No advanced installation options are discussed here - just the basics that will work for 95% of users who want to get started. This guide will lead you through the process of configuring, installing, and developing *SBC-SMART-MEN*. This guide was written to be as clear as possible and to provide only the details necessary to get you up and running. For more in-depth information, links to other chapters will be located where appropriate.

Step1. Plug a working SD card into SD slot

Prepare for a binary pre-installed SD first. Plug the SD card into SD card slot. Please refer to Embedian "*SBC-SMART-MEN* Software Installation Guide" to learn how to prepare for a working SD card.



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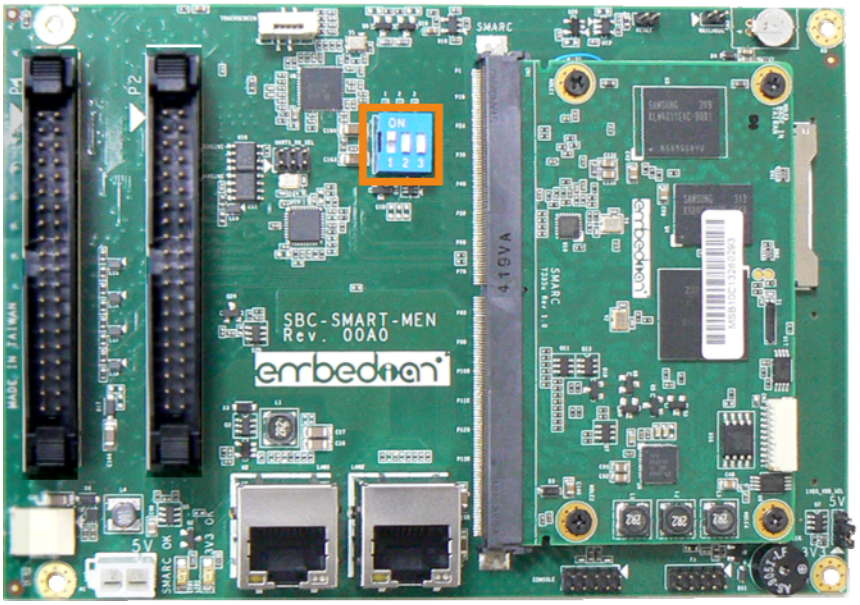
Step2. Check Jumpers and Switches

SW1 switch should be set as SD boot (ON OFF OFF) and make sure that RESET jumper is not shunt.



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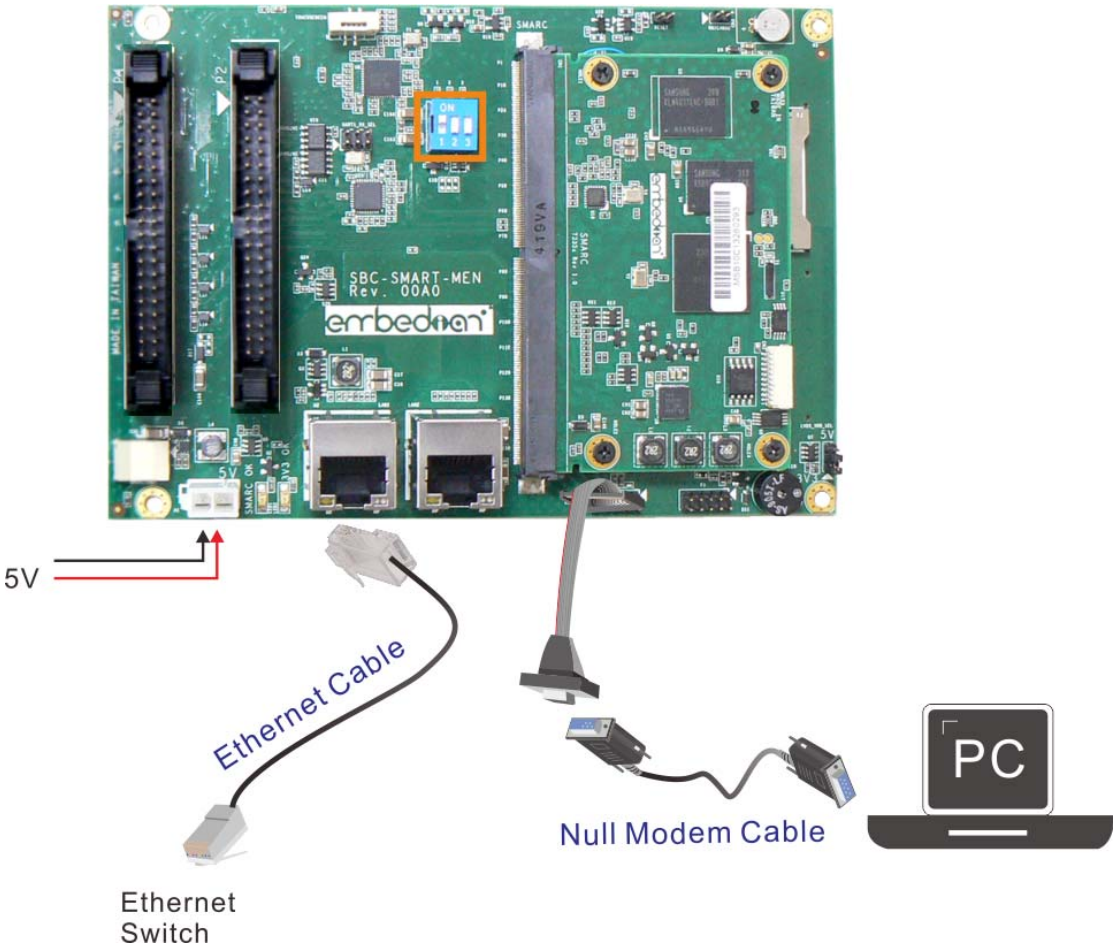
Step3. Wired the console and Ethernet cable

Connect the *DB9* to *10-way box header* console debug cable from *console header* of the device to a null modem (*TX/RX* crossed) cable and connect that null modem cable to your PC. Also connect Ethernet cable from *LAN1* of the device to an Ethernet switch. It is illustrated as the following diagram.



Open a serial terminal like Putty in your PC. Set the *COM* port as *115200, 8n1.*

Step4. Power 5V to the device

Apply 5V to *power* connector of the device. If you see the *LED* light on, that means the power is fine.

You will see the root filesystem booting. There is no root password required if the root filesystems is Arago. The default root password for Ubuntu root filesystems is “*root*” (no quotation). Default Ethernet is set as *DHCP*.